CLAIMS

1. A method for controlling the morphology of deposited silicon on a silicon dioxide substrate comprising the steps of:

providing a layer of silicon dioxide;

implanting hydrogen ions into said layer of silicon dioxide by plasma source ion implantation; and

forming a layer of polycrystalline silicon on said layer of silicon dioxide.

2. A method for pretreating silicon dioxide comprising the steps of:

providing a layer of silicon dioxide; and

implanting hydrogen ions into a surface of said layer of silicon dioxide by plasma source ion implantation.

3. A method for forming a semiconductor device precursor comprising the steps of:

providing a semiconductor substrate;

forming a layer of silicon dioxide on said semiconductor substrate;

implanting hydrogen ions by plasma source ion implantation into said layer of silicon dioxide; and

forming a layer of polycrystalline silicon on said layer of silicon dioxide.

4. A method for forming a semiconductor device precursor comprising the steps of:

providing a semiconductor substrate;

forming a layer of silicon dioxide on said semiconductor substrate;

exposing said semiconductor substrate to a hydrogen plasma containing hydrogen ions; and

applying a high voltage pulse to said semiconductor substrate thereby implanting hydrogen ions from said ionized hydrogen plasma into a surface of said

layer of silicon dioxide so that a subsequently formed layer of polycrystalline silicon has a smooth morphology.

5. A method for forming a semiconductor device precursor comprising the steps of:

providing a semiconductor substrate;

forming a layer of silicon dioxide on said semiconductor substrate;

exposing said semiconductor substrate to a hydrogen plasma containing hydrogen ions;

applying a high voltage pulse to said semiconductor substrate to implant hydrogen ions from said ionized hydrogen plasma into a surface of said layer of silicon dioxide so that a subsequently formed layer of polycrystalline silicon has a smooth morphology; and

forming a polycrystalline silicon film on said surface of said layer of silicon dioxide.

6. A method for forming a semiconductor device comprising the steps of:

providing a semiconductor substrate;

forming a layer of silicon dioxide on said semiconductor substrate;

implanting hydrogen ions by plasma source ion implantation into said layer of silicon dioxide; and

forming a layer of polycrystalline silicon on said layer of silicon dioxide.

7. A method for forming a field effect transistor comprising the steps of:

providing a semiconductor substrate having a layer of silicon dioxide formed thereon;

implanting hydrogen ions by plasma source ion implantation into said layer of silicon dioxide;

forming a layer of polycrystalline silicon on said layer of silicon dioxide; and

forming a source, a drain and a gate in said semiconductor substrate.

8. A method for forming a memory array, said memory array comprising a plurality of memory cells arranged in rows and columns, each of said plurality of memory cells comprising at least one field effect transistor, said method comprising the steps of:

providing a semiconductor substrate;

forming a layer of silicon dioxide on at least a portion of said semiconductor substrate;

implanting hydrogen ions into at least a portion of said layer of silicon dioxide by plasma source ion implantation;

forming a layer of polycrystalline silicon over at least said portion of said layer of silicon dioxide into which said hydrogen ions were implanted; and

forming a gate, a source and a drain for each of said field effect transistors, on said semiconductor substrate.

9. A semiconductor device precursor comprising:

a semiconductor substrate;

a layer of silicon dioxide formed on said semiconductor substrate, said layer of silicon dioxide having been doped with hydrogen ions deposited by a plasma source ion implantation process to provide a layer of polycrystalline silicon, which is subsequently deposited on said layer of silicon dioxide with a smooth morphology; and

a layer of polycrystalline silicon formed on said layer of silicon dioxide.

Sub Q3 Contd.

10. A field effect transistor comprising:

a semiconductor substrate;

a layer of silicon dioxide formed on at least a portion of said semiconductor substrate, said layer of silicon dioxide having hydrogen ions implanted therein by plasma source ion implantation;

a layer of polycrystalline silicon formed on at least a portion of said layer of silicon dioxide; and

a source, a drain and a gate formed in said semiconductor substrate to form a field effect transistor.

11. A memory array comprising:

a semiconductor substrate;

a layer of silicon dioxide formed on at least a portion of said semiconductor substrate, said layer of silicon dioxide having hydrogen ions implanted into at least a portion of said layer of silicon dioxide by plasma source ion implantation;

a layer of polycrystalline silicon formed over at least said portion of said layer of silicon dioxide into which said hydrogen ions were implanted;

a plurality of memory cells arranged in rows and columns, each of said plurality of memory cells comprising at least one field effect transistor; and

a gate, a source and a drain for each of said field effect transistors formed on said semiconductor substrate.

12. A semiconductor wafer comprising:

a wafer including a semiconductor substrate, said wafer being divided into a plurality of die;

a layer of silicon dioxide formed on at least a portion of said semiconductor substrate, on each of said plurality of die said layer of silicon dioxide having hydrogen ions implanted into at least a portion of said layer of silicon dioxide by plasma source ion implantation;

Sub a' cont'd.

a layer of polycrystalline silicon formed over at least said portion of said layer of silicon dioxide into which said hydrogen ions were implanted; and

a repeating series of gates, sources and drains for at least one field effect transistor formed on each of said plurality of die, said series of gates, sources and drains being formed on said semiconductor substrate.

13. A method for forming a thin film transistor comprising the steps of:

providing a semiconductor substrate formed from a material selected from the group consisting of silicon dioxide, quartz and glass;

forming a layer of a gate oxide material in said semiconductor substrate;

implanting, by plasma source ion implantation, hydrogen ions into a surface of said semiconductor substrate;

forming a layer of polycrystalline silicon on said surface of said semiconductor substrate;

forming a layer of an insulating material on said layer of polycrystalline silicon;

forming a source region and a drain region; and

forming a gate electrode on said layer of insulating material.

Sub a'

14. A thin film transistor comprising:

a semiconductor substrate formed from a material selected from the group consisting of silicon dioxide, quartz and glass, said semiconductor substrate having hydrogen ions implanted therein by plasma source ion implantation;

a layer of polycrystalline silicon formed on at least a portion of semiconductor substrate;

a layer of a insulating material formed on at least a portion of said layer of polycrystalline silicon;

a source region and a drain region formed on said layer of polycrystalline silicon; and

a gate electrode formed on said layer of insulating material.